MOVEMENT AND LOCOMOTION



Endoskeleton Framework of Man

| HUMAN SKELETION – 206 bones | | | | |
|-----------------------------|---------------------------|------------------------|--------------------|--|
| Axia | 1-80 | Appendicular-126 | | |
| AF | PPENDICULAR SKEI | LETION – 126 BONES | | |
| LIMB BO | NES - 120 | GIRDLE B | ones - 06 | |
| Fore limb Bones - 60 | Hind limb Bones-60 | Pectoral Girdle - 4 | Pelvic Girdle - 2 | |
| Humerus – 1×2 | Femur -1×2 | Scapula – 1×2 | | |
| Radius – 1×2 | Patells -1×2 | Clavicle -1×2 | | |
| Ulna – 1×2 | Tiba – 1×2 | | (is formed by 2 | |
| Carpals -8×2 | Fibula – 1×2 | | hip bones and | |
| Metacarplas – 5×2 | Tarsls -7×2 | | each hip bone is | |
| Phalanges – 14×2 | Metatarsals -5×2 | | formed by fusion | |
| | Phalanges – 14×2 | | of 3 hip bones | |
| | Phalanges -14×2 | | ilium, ischium and | |
| | e | | punbis) | |

| SKULL SKE | CLETION-29 | STERNUM-01 | RIBS-24 | VERTEBRIAL |
|---------------|-------------------|--------------|-----------------------------|-------------------|
| | | | | COLUMN-26 |
| Cranial - 8 | Facial - 14 | | True - 14 | Cervical - 7 |
| Frontal - 1 | Maxilla - 2 | | False - 10 | Thoracic - 12 |
| Parietal - 2 | Palatine - 2 | | | Lumbar - 5 |
| Temporal - 2 | Zygomatic - 2 | | | Sacral - 5 |
| Occipital - 1 | Nasal - 2 | | | Coccygeal - 4 |
| Ethmoid - 1 | Lacrymal - 2 | | | |
| Sphenoid - 1 | Inferior | | | |
| | Turbinals - 2 | | | |
| | Mandible - 1 | | | |
| | Vomer - 1 | | | |
| | ASSO | CIATED SKULL | BONES - 07 | |
| Hyoid H | Bone - 1 | Ear ossicle | es - 2×3 (Malleus, | Incus, Stapes) |

Phalangeal formula is 23333

Bones formed by ossification of tendons are called sessamoid bones.

Longest and strongest bone of human body is femur.

Smallest bone of human body is stapes.

Rabbit -axial skeleton 132 bones, appendicular skeleton 128 bones

INTRODEUCTION

Skeletal system consists of a framework of bones and a few cartilages.

Two types of skeleton are endoskeleton and exoskeleton.

Exoskeleton develops from epidermis e.g. nails, horns, hooves, feathers, scales, claws etc.

Exoskeleton is ectodermal in origin and nonliving.

Endoskeleton is mesodermal in origin and is living in nature.

This system has a significant role in movement shown by the body. Imagine chewing food without jaw bones and walking around without the limb bones. Bone and cartilage are specialised connective tissues.

The former has a very hard matrix due to calcium salts in it and the latter has slightly pliable matrix due to chondroitin salts. In human beings, this system is made up of 206 bones and a few cartilages. It is grouped into two principal divisions- the axial and the appendicular skeleton.

Axial skeleton comprises 80 bones distributed along the main axis of the body.

The skull vertebral column, sternum and ribs constitute axial skeleton.

SKILL

The skull is composed of two sets of bones - cranial and facial. that totals to 22 bones. Cranial bones are 8 in number (frontal-1. parietal-2. temporal-2. occipital-1. ethmoid-1 and sphenoid). They form the hard protective outer covering. cranium for the brain. Cavity of sphenoid bone is called sella turcica in which pituitary gland is present.

The facial region is made up of 14 skeletal elements (Inferior turbinals-2, Maxilla-2, Malar(Zygomaticl-2, Nasal- 2, Palatine-2, Lacrymal-2, Vomer-1, Mandible-1) which form the front part of the skull. A single U-shaped bone called hyoid is present at the base of the buccal cavity and it is also included in the skull.

Hyoid bone is the only bone which is not attached with any other bone of the body. Tongue is attached with hyoid bone



Diagrammatic view of human skull

Each middle ear contains three tiny bones - Malleus, Incus and Stapes, collectively called Ear Ossicles. Joint between malleus and incus is hinge whearas joint between incus and stapes is ball and socket Malleus is modification of articular bone, Incus is modification of quadrate bone, Stapes is smallest bone of body modification of hyomandibular bone. The skull region articulates with the superior region of the vertebral column with the help of two occipital condyles (dicondylic skull). An opening is present at the base of occipital bone called foramen of magnum. Medulla oblongata leave out through foramen of magnum and enter into the cavity of vertebral column. This extended part of medulla oblongata is called spinal cord.

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| Skull is monocondylic | in | reptiles | and | birds | whereas | dicondylic | in | amphibians | and |
|-----------------------|----|----------|-----|-------|---------|------------|----|------------|-----|
| mammals. | | | | | | | | | |

All these bones of skull are joined together by suture.

- Eg. (1) Coronal suture : Between the frontal & parietal bone
 - (2) Lambdoidal suture : Between parietal & occipital
 - (3) Saggital suture : Between parietal & parietal

| | BEGINNER'S BOX-1 | | | | | |
|-----|-------------------------|-----------------------|------------------------|-------------------|--|--|
| 1. | Skull of Rabbit I Man | is:- | | | | |
| | (1) Monocondylic | (2) Dicondylic | (3) Tricondylic | (4) Tetracondylic | | |
| 2. | Total number of skull | skeleton bones in hun | nan:- | | | |
| | (1) 29 | (2) 49 | (3) 39 | (4) 19 | | |
| 3 | Single hope of lower | aw in human is : | | | | |
| 5. | (1) Maxilla | (2) Mandible | (3) Nasal | (4) Pterygoid | | |
| _ | | | | | | |
| 4. | Spinal cord passes to | brain through: | (2) Foramen of mage | ndie | | |
| | (3) Foramen of ovale | , | (4) Foramen of Magn | um | | |
| | | | | | | |
| 5. | Total number of bone | of human face:- | (1) 14 | (2) 16 | | |
| | (1) 10 | (2) 12 | (1) 14 | (2) 10 | | |
| 6. | Number of bones pese | ent in human cranium | is : | | | |
| | (1) 8 | (2) 10 | (1) 12 | (2) 16 | | |
| 7. | Joint between bones of | f human skull is : | | | | |
| | (1) Hinge joint | | (2) Synovial joint | | | |
| | (3) Cartilaginous joint | t | | | | |
| 8. | Surface for attachmen | t of tongue is : | | | | |
| | (1) Palatine | 5 | (2) Sphenoid | | | |
| | (3) Pterygiod | | (4) Hyoid apparatus | | | |
| 9. | Smallest bone in Rabl | oit & Man is :- | | | | |
| | (1) Nasal | (2) Patella | (3) Stapes | (4) Palatine | | |
| 10 | Stance is modification | of | | | | |
| 10. | (1) Hyomandibular | 1 01: | (2) Palatine | | | |
| | (3) Quadrate | | (4) Squamosal | | | |
| 11 | Laind hadana a Lance Q | | | | | |
| 11. | (1) Ball & socket join | t stapes is : | (2) Hinge joint | | | |
| | (3) Pivot joint | - | (4) Gliding joint | | | |
| 10 | . | o · · · | | | | |
| 12. | Joint between malleus | s & incus is; | (2) Ball & socket join | t | | |
| | (3) Pivot joint | | (4) Hinge joint | u | | |
| | - | | | | | |

VERTEBRAL COLUMN

Our vertebral column is formed by 26 serially arranged units called vertebrae and is dorsally placed. It extends from the base of the skull and constitutes the main framework of the trunk. Each vertebra has a central hollow portion (neural canal) through which the spinal cord passes. The vertebral column is differentiated into cervical (7), thoracic (12), lumbar (5), sacral (1-

fused) and coccygeal (1-fused) regions starting from the skull. The number of cervical vertebrae are seven in almost all mammals including human beings.

- Body of vertebrae called as centrum.
- Shape of centrum like a short cylinder, with flat upper and lower surfaces. (Amphiplatyan centrum)
- Centrum of two adjoining vertebrae attached through intervertebral disc (cartilagenous joint).
- On dorsal surface of centrum vertebral foramen/ spinal foramen is present. All vertebral foramen allinged one over each other to make a vertebral canal/neural canal which carries spinal cord.
- Above it neural arch is present through which spinous process/ neural spine arise. It is projecting backwards and downwards.
- On both lateral side transverse process are present.
- Articular processes : Projecting upwards and downwards (Prezygapophysis and postzygapophysis). These process articulates with the articular processes of adjoining vertebrae through gliding joint.
- Two adjoining vertebrae therefore articulate at three joints, with each other (Two between left and right articular processes and one between the body of vertebrae).

Cervical Vertebrae (Smallest vertebrae)

- The number of cervical vertebrae are seven in almost all mammals including human being.
- All cervical vertebrae have apertures in their transverse process called as Foramina transversarium. Which alainged to form vertebroarterial canal. Through this canal vertebral artery passes. This artery supply blood in brain and spinal cord.
- Spinous process of cervical vetebrae is bifid (Except C₇)
- Only C₇ has demifacets where upper part of head of 1st rib articulates. First vertebra is the atlas and it articulates with the occipital condyles with condylar joint. Condylar joint is responsible for yes movement. (Upward and downward movement)

Centrum, Pre and Postzygopophysis are absent in atlas.

Second vertebrae is axis vertebrae. Atlas has an opening called odontoid fossa in which projection (Odontoid process) of axis fit and form pivot joint. No movement is the result of pivot joint (No movement means sideways movement)

Post zygapophysis and centrum are present but prezygopophysis is absent in axis.

Thoracic vertebrae

Identified by :

They are larger than cervical vertebrae.

They are identify by the presence of costal demifacetes on the centrum.

On their transverse processes, tubercular facets are present in which tubercle part of rib articulates.

LUMBAR VERTEBRAE

These are the largest sized vertebrae because they have to support the weight of upper body.

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Sacrum

Large flattened triangular bone formed by fusion of five sacral vertebrae.

Coccyx

It is vestigial in human and formed by fusion of 4 coccygeal vertebrae.



- (1) The hip and shoulder joint
- (2) Between the atlas and the odontoid process of the axis
- (3) Sternoclavicular joint
- (4) Tempomandibular joint
- 9.The number of cervical vertebrae in mammals including human being are
(1) 7(2) 8(3) 9(4) 10
- 10.The major function of intervertebral disc is
(1) absorb shock(2) Str
(4) pre-(3) prevent injuries(4) pre-
 - (2) String vertebrae together
 - (4) prevent hyper extension
- **11.** Cervical vertebrae are characterized by the presence of :-
 - (1) Long neural spine
 - (3) Vertebra- arterial canals
- 12. Spinal cord passes to brain through:(1) Foramen of monro(3) Foramen of ovale
- (2) Odontoid process(4) Flat centrum
- (2) Foramen of magendie
- (4) Foramen of Magnum
- 13. Which of following helps in rotation of the neck:-
 - (1) Atlas
 - (3) Cervical

(2) Axis

(4) Occipital condyle of skull

Significance of vertebral column

- (1) The vertebral column protects the spinal cord
- (2) The vertebral column supports the head
- (3) The vertebral column serves as the point of attachment for the ribs and musculature of the back

STERNUM

Sternum is a flat bone on the ventral midline of thorax. There are three parts of sternum – prosternum(manubrium), mesosternum and metasternum (xiphoid process). Clavicle and 1^{st} pair of ribs are attached with manubrium. 2^{nd} to 7^{th} pair of ribs are attached with mesosternum. Xiphoid process is smallest part, lower half of 7^{th} coastal cartilage articulate.

The sternum is a favoured site for obtaining samples of haemopoietic tissue during diagnosis of suspected blood diseases.



RIBS

Ribs : There are 12 pairs of ribs. Each rib is a thin flat bone connected dorsally to the vertebral column and ventrally to the sternum. It has two articulation surfaces on its dorsal end and is hence called bicephalic.

First seven pairs of ribs are called true ribs. Dorsally, they are attached to the thoracic vertebrae and ventrally connected to the sternum with the help of hyaline cartilage. The 8th, 9th and 10th pairs of ribs do not articulate directly with the sternum but join the seventh rib with the help of hyaline cartilage. These are called vertebrochondral (false) ribs. Last 2 pairs (11th and 12th) of ribs are not connected ventrally and are therefore, called floating ribs (false ribs). Thoracic vertebrae, ribs and sternum together form the rib cage.

There are five parts of rib cage :

- (1) Dorsal consist of vertebral column and ribs
- (2) Ventral consist of sternum and ribs
- (3) Lateral consist of ribs
- (4) Anterior consist of neck and clavicle
- (5) Posterior consist of diaphragm

| | 1st Thorac | cic vertebra | Facet for c | lavcie |
|----------------------------|--|---|---|--|
| | Prosternum (Ma | anubrium) | 1st Rib | |
| | | | 2nd Ri | b . |
| | Mesosternum (body) | | | |
| | | The | Telos L | Sternum |
| | | | | |
| | | | S | - Costal cartilage |
| | | | | |
| | | | | - 6th Rib |
| | | | | -Metasternum (Xiphid process) |
| | | | | - 7th Rib |
| | | X ZIV S | | - 8th Rib |
| | Xiphoid process | | LON / C+ | |
| | | | 12th Thoracic | |
| | | 12th Rib | verteb <mark>ra</mark> | |
| | | A. | 0 | 11th Rib |
| | | Bones of the | norax (front view) | |
| | | | | |
| | 1 | BEGI | INER'S BOX-3 | |
| 1. | Number of floating | BEGIN g ribs in human:- | NNER'S BOX-3 | |
| 1. | Number of floating (1) 6 pairs | BEGI g ribs in human:- (2) 5 pairs | NNER'S BOX-3 (3) 3 pairs | (4) 2 pairs |
| 1. | Number of floating (1) 6 pairs | BEGIN g ribs in human:- (2) 5 pairs | NNER'S BOX-3 (3) 3 pairs | (4) 2 pairs |
| 1. 2. | Number of floating (1) 6 pairs 5 Pairs of false ribs (1) Man | BEGIN g ribs in human:- (2) 5 pairs s present in:- (2) Rabbit | NNER'S BOX-3 (3) 3 pairs | (4) 2 pairs (4) Fish |
| 1. 2. | Number of floating (1) 6 pairs 5 Pairs of false ribs (1) Man | BEGIN g ribs in human:- (2) 5 pairs s present in:- (2) Rabbit | NNER'S BOX-3 (3) 3 pairs (3) Frog | (4) 2 pairs (4) Fish |
| 1. 2. 3. | Number of floating (1) 6 pairs 5 Pairs of false ribs (1) Man Vertebrochondral r | BEGIN g ribs in human:- (2) 5 pairs s present in:- (2) Rabbit tibs in man are :- | NNER'S BOX-3 (3) 3 pairs (3) Frog | (4) 2 pairs (4) Fish |
| 1. 2. 3. | Number of floating (1) 6 pairs 5 Pairs of false ribs (1) Man Vertebrochondral r (1) 8 th , 9 th , 10 th ribs (2) 0 th , 10 th , 11 th , 11 | BEGIN g ribs in human:- (2) 5 pairs s present in:- (2) Rabbit ribs in man are :- | NNER'S BOX-3 (3) 3 pairs (3) Frog (3) 7th, 8th, 9th ribs (4) cth, 7th, 9th ribs | (4) 2 pairs (4) Fish |
| 1. 2. 3. | Number of floating (1) 6 pairs 5 Pairs of false ribs (1) Man Vertebrochondral r (1) 8 th , 9 th , 10 th ribs (3) 9 th , 10 th , 11 th ribs | BEGIN g ribs in human:- (2) 5 pairs s present in:- (2) Rabbit tibs in man are :- s | NNER'S BOX-3 (3) 3 pairs (3) Frog (3) 7 th , 8 th , 9 th ribs (4) 6 th , 7 th , 8 th ribs | (4) 2 pairs (4) Fish |
| 1. 2. 3. | Number of floating (1) 6 pairs 5 Pairs of false ribs (1) Man Vertebrochondral r (1) 8 th , 9 th , 10 th ribs (3) 9 th , 10 th , 11 th rib | BEGIN g ribs in human:- (2) 5 pairs s present in:- (2) Rabbit ribs in man are :- s os | NNER'S BOX-3 (3) 3 pairs (3) Frog (3) 7 th , 8 th , 9 th ribs (4) 6 th , 7 th , 8 th ribs | (4) 2 pairs (4) Fish |
| 1. 2. 3. 4. | Number of floating (1) 6 pairs 5 Pairs of false ribs (1) Man Vertebrochondral r (1) 8 th , 9 th , 10 th ribs (3) 9 th , 10 th , 11 th ribs (3) 9 th , 10 th , 11 th ribs (3) 9 th , 10 th , 11 th ribs | BEGIN g ribs in human:- (2) 5 pairs s present in:- (2) Rabbit ribs in man are :- s os of ribs in human body (2) 12 | NNER'S BOX-3 (3) 3 pairs (3) Frog (3) 7 th , 8 th , 9 th ribs (4) 6 th , 7 th , 8 th ribs 7 is : (3) 24 | (4) 2 pairs (4) Fish (4) 36 |
| 1. 2. 3. 4. | Number of floating (1) 6 pairs 5 Pairs of false ribs (1) Man Vertebrochondral r (1) 8 th , 9 th , 10 th ribs (3) 9 th , 10 th , 11 th ribs (3) 9 th , 10 th , 11 th ribs | BEGIN g ribs in human:- (2) 5 pairs s present in:- (2) Rabbit tibs in man are :- s os of ribs in human body (2) 12 | NNER'S BOX-3 (3) 3 pairs (3) Frog (3) 7 th , 8 th , 9 th ribs (4) 6 th , 7 th , 8 th ribs 7 is : (3) 24 | (4) 2 pairs (4) Fish (4) 36 |
| 1. 2. 3. 4. 5. | Number of floating (1) 6 pairs 5 Pairs of false ribs (1) Man Vertebrochondral r (1) 8 th , 9 th , 10 th ribs (3) 9 th , 10 th , 11 th rib (3) 9 th , 10 th , 11 th rib The total number of (1) 10 Ribs are attached to (1) Scapula | BEGIN g ribs in human:- (2) 5 pairs s present in:- (2) Rabbit ribs in man are :- s os of ribs in human body (2) 12 o : (2) Sternum | NNER'S BOX-3 (3) 3 pairs (3) Frog (3) 7 th , 8 th , 9 th ribs (4) 6 th , 7 th , 8 th ribs v is : (3) 24 (3) Clavicle | (4) 2 pairs (4) Fish (4) 36 (4) Ilium |

Appendicular skeleton :

The bones of the limbs alongwith their girdles constitute the appendicular skeleton. Each limb is made of 30 bones.

FORE LIMB BONES

The bones of the hand (fore limb) are humerus, radius and ulna, carpals (wrist bones -8 in number), metacarpals (palm bones -5 in number) and phalanges (digits -14 in number).



Humerus : Head of humerus articulates with the glenoid cavity of scapula to form shoulder joint (ball and socket joint). This bone has an elevated rough part on the shaft called deltoid ridge where deltoid muscles are attached. Lower end of humerus articulates laterally with radius and medially with ulna.

Radius and Ulna : Head of radius is disc shaped, covered with hyaline cartilage. Superior concave surface of head of radius articulates with the humerus at the elbow joint. Circumference of head of radius fits into socket of ulna to form radioulnar joint. Inferior surface of radius bears an articular area for scaphoid and lunate bone. Upper end of ulna articulate with humerus whereas lower and articulate with carpals.



| | LATERAL ——— | | \longrightarrow MEDIA | N |
|--------------|-------------|-----------|-------------------------|----------|
| Proximal row | She | Looks | Тоо | Pretty |
| | SCAPHOID | LUNATE | TRIQUETRUM | PISIFORM |
| | TRAPEZIUM | TRAPEZOID | CAPITATE | HAMATE |
| Distal row | Try | То | Catch | Her |

The only sesamoid bone of forelimb is pisiform Metacarpal bones are 5 in number Phalangeal formula is 23333



Bones of left forearm (anterior aspect)

Bones of right hand and wrist

HIND LIMB BONES

Femur (thigh bone - the longest strongest and heaviest bone), tibia and fibula tarsals (ankle bones - 7 in number). metatarsals (5 in number) and phalanges (digits -14 in number) are the bones of the legs (hind limb).

A cup shaped bone called patella cover the knee ventrally (knee cap).

The only sesamoid bone of hindlimb is patella

Phalangeal formula is 23333

Femur:

Head of femur: Directed medialy, upwards.

- Articulates with acetabulum to form the hip joint. (Ball and Socket joint)

Lower end of femur is widely expanded to form two large condyles, one medial & one lateral.

Patella bone : Small, triangular, sesamoid bone. It is knee bone and located in the pateller groove of femur bone upon knee joint.

Tibia

Medial & larger bone of the leg.

Upper end articulates with femur bone.

Fibula

Lateral & smaller bone of the leg.

Its upper end articulates with the tibia

It does not participate in the formation of knee joint.

Its lower end fused with tibia and form inferior tibiofibular joint (immovable joint)





Left tibia and fibula (anterior aspect)

Tarsals

Ankle is made of seven tarsal bones arranged in two rows.

Proximal row : Talus above, Navicular in between and Calcaneum below.

Tarsal bones are much larger & stronger than carpal bones because they have to support & distribute body weight.

Talus is second largest tarsal bone, lies between tibia above & calcaneum below.

Calcaneum : Largest tarsal bone, forms the prominence of heal.

Communicate body weight towards posterior during standing condition.

Distal row :- Four tarsal bones lying side by side (cuneiform I, II, III and one cuboid)

Metatarsals

5 meta tarsal bones which are numbered medial to lateral.

Phalanges

- 14 Phalanges, 2 for great toe & 3 each for other four toes.
- As compared to Phalanges of hand, these are small in size.
- Digital formula = 2, 3, 3, 3, 3



Bones of left foot (Upper aspect)



GIRDLES

Pectoral and Pelvic girdle bones help in the articulation of the upper and the lower limbs respectively with the axial skeleton. Each girdle is formed of two halves.

Each half of pectoral girdle consists of a clavicle and a scapula. Scapula is a large triangular flat bone situated in the dorsal part of the thorax between the second and the seventh ribs. The dorsal, flat, triangular body of scapula has a slightly elevated ridge called the spine which projects as a flat, expanded process called the acromion.



depression called the glenoid cavity which articulates with the head of the humerus to form the shoulder joint. Each clavicle is a long slender bone with two curvatures. This bone is commonly called the collar bone.



Plevic girdle consists of two coxal bones. Each coxal bone is formed by the fusion of three bones – ilium, ischium and pubis. At the point of fusion of the above bones is a cavity called acetabulum to which the thigh bone articulates. The two halves of the pelvic girdle meet ventrally to form the pubic symphysis containing fibrous cartilage.



Human pelvis from anterior aspect

| Differences Between Male and Female Pelvis | | | | |
|---|--------------------------|-------------------|--|--|
| 1. General width | Hips are wider | Hips are narrower | | |
| 2. Pubis | Longer, more rectangular | Short, Triangular | | |
| 3. Sacrum | Shorter, wider | Narrower, longer | | |

BEGINNER'S BOX-4

| 1. | Os Innominatum con | sist of :- | | |
|----------|-------------------------------|------------------------|---------------------|----------------------|
| | (1) Pubis | (2) Ischium | (3) Ilium | (4) All of the above |
| | | | | |
| 2. | Total number bones | in Appendicular skelet | on of human:- | |
| | (1) 126 | (2) 80 | (3) 44 | (4) 33 |
| | | | | |
| 3. | Longest bone of hum | an skeleton :- | | |
| | (1) Femur | (2) Humerus | (3) Tibia | (4) Radius |
| | | | | |
| 4. | Digital formula of Ha | and of Human is :- | | |
| | (1) 23333 | (2) 03322 | (3) 33332 | (4) 02233 |
| | | | | |
| 5. | Scapula is part of:- | | | |
| | (1) Skull | (2) Pelvic Gridle | (3) Pectoral Girdle | (4) Vertebral column |
| Dowor h | v. VISIONat Info Solution Det | I ta | | |
| I UWEL D | y. visional mu solution i vi. | Liu | | |

| 6. | Obturator foramen pro (1) Ilium & Ischium | esent between:- (2) Ischium & Pubis | (3) Ilium & pubis | (4) None |
|-----|--|--|-----------------------|------------|
| 7. | Number of tarsal bone | es in Human in each hi | nd limb | |
| | (1) 2 | (2) 7 | (3) 6 | (4) 5 |
| 8. | Which one is bone of | fore.limb: | | |
| | (1) Humerus | (2) Femur | (3) Tibia | (4) Fibula |
| 9. | A cup shaped cavity f | or articulation of femu | r head is : | |
| | (1) Acetabulum | | (2) Glenoid cavity | |
| | (3) Sigmoid notch | | (4) Obturator foramer | 1 |
| 10. | Number of bones pres | sent in a forelimb of hu | ıman: | |
| | (1) 30 | (2) 32 | (3) 35 | (4) 40 |

JOINTS

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Joints are essential for all types of movements involving the bony parts of the body. Locomotory movements are no exception to this. Joints are points of contact between bones. or between bones and cartilages. Force generated by the muscles is used to carry out movement through joints, where the joint acts as a fulcrum. The movability at these joints very depending on different factors. Joints have been classified into three major structural forms, namely, fibrous, cartilaginous and synovial.

Fibrous joints (Immovable joints) (SYNARTHROSIS) do not allow any movement. This type of joint is shown by the flat skull bones which fuse end-to-end with the help of dense fibrous connective tissues in the form of sutures, to form the cranium.

In cartilaginous joints (SYNCHONDROSIS), the bones involved are joined together with the help of cartilages. The joint between the adjacent vertebrae in the vertebral column is of this pattern and it permits limited movements.

Synovial joints (DIARTHROSIS) are characterised by the presence of a fluid filled synovial cavity between the articulating surfaces of the two bones. Such an arrangement allows considerable movement. These joints help in locomotion and many other movements. Ball and socket joint (between humerus and pectoral girdle), Hinge joint (knee joint). Pivot joint (between atlas and axis), Gliding joint between the carpals) and Saddle joint (between carpal and metacarpal of thumb) are some examples

Maximum degree of mobility can be seen with a ball and socket synovial joint because ball can rotate in a hollow spherical socket on infinite axis.

| | | JUINIS | |
|----------|---------|--------------------------------|-------------------------|
| | 1. | BW. ACROMAIN PROCESS- CLAVICLE | ACRMOIOCLAVICULAR JOINT |
| | 2. | BW. STERNUM-CLAVICLE | STERNOCLAVICULAR JOINT |
| | 3. | HEAD OF HUMERUS AND GLENOID | BALL AND SOCKET JOINT |
| | | CAVITY OF SCAPULA | |
| | 4. | HUMERUS-RADIUS-ULNA | HINGE JOINT |
| | 5. | RADIUS-ULNA | RADIOULNAR |
| | | | (PIVOT)(SYNDESMOSIS) |
| | 6. | BW. CARPALS | GLIDING JOINT |
| | 7. | BW. CARPALS AND METACARPAL OF | SADDLE JOINT |
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JOINTS

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| | THUMB | | | | | | |
|-----|----------------------------|-----------------------|--|--|--|--|--|
| 8. | BW. PHALANGES | HINGE JOINTS | | | | | |
| 9. | ACETABULUM OF HIP BONE AND | BALL AND SOCKET JOINT | | | | | |
| | HEAD OF FEMUR | | | | | | |
| 10. | KNEE JOINT | HINGE JOINT | | | | | |
| 11. | TIBIA-FIBULA | TIBIO FIBULAR | | | | | |
| 12. | ANKLE JOINT | HINGE JOINT | | | | | |
| 13. | BW. PHALANGES | HINGE JOINTS | | | | | |
| 14. | BW. TARSALS | GLIDING JOINTS | | | | | |
| 15. | PUBIS-PUBIS | PUBIS SYMPHYSIS | | | | | |
| 16. | BW. CRANIAL BONES | SUTURES | | | | | |
| 17. | BW. ATLAS AND AXIS | PIVOT JOINT | | | | | |
| 18. | TEETH IN SOCKETS | GOMPHOSIS | | | | | |
| 19. | INTERVERTEBRAL DISCS | CARTILAGENOUS | | | | | |
| 20. | BW.STERNUM AND RIBS | CARTILAGENOUS | | | | | |

- Study of body movements is called kinesiology
- Study of joints is called anthology
- Comparative study of skull is called cardiology

DISORDERS OF BONES

(1) **ARTHRITIS** : It is caused by the inflammation of the joints. This is of several types, e.g. rheumatoid arthritis, osteoarthritis and gouty arthritis.

(i) The rheumatoid arthritis: It is diagnosed by the presence of rheumatoid factor (a type of immunoglobulin IgM). It is the primary symptom of inflammation of synovial membrane. If it is left untreated, then the I membrane thickens and synovial fluid increases, exerting pressure that causes pain. The membrane then starts secreting abnormal granules, called pannus, which after accumulating on the surface of the cartilage, cause its erosion. As a result, the fibrous tissues are attached with the bones and become ossified, making the joints immovable. Its treatment concentrates on reduction of pain and inflammation by heat treatment and physiotherapy and, in extreme cases, replacement of the damaged joints.

(ii) Osteoarthritis : Is a degenerative joint disease characterised by the degeneration of the articular cartilage and proliferation of new bones. Usually, afflected joints are of spine, knees and hands.

(iii) Gouty arthritis or gout : It is caused either due to excessive formation of uric acid, or inability to excrete it. It gets deposited in joints as monosodium salt.

(2) **OSTEOPOROSIS** : It is age-related disorder characterised by decreased bone mass and increased chances of fractures. Decreased level of estrogen is a common cause.

BEGINNER'S BOX-5

1. Elbow joint is: (1) Ball & socket

(3) Gliding

(4) Hinge

2. Shoulder joint present between:-(1) Glenoid cavity of pectoral girdle & head of humerus

(2) Pivot

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| | (2) Coronoid process of pectoral girdle & head of humerus (3) Radius, ulna and humerus (4) Radius and humerus | | | | | | | | | | | | | |
|--|---|------------|-----|-----|-----|-------------|---------------|--|------------|-----------------------|-----|--------|-----|--|
| 3. | Head of humerus is articulated with pectoral girdle by a joint :(1) Hinge(2) Ball and socket(3) Immovable(4) Pivot joint | | | | | | | | | | | | | |
| 4. | Which one is a ball and socket joint ?(1) Knee joint(3) Humerus and pectoral girdle | | | | | | | (2) Elbow joint(4) Atlas & Axis | | | | | | |
| 5. | Which one of the following is correctly matched? (1) Hinge joint -between vertebrae (2) Gliding joint -between zygophysis of the successive vertebrae (3) Fibrous joint - between phalanges (4) Cartilaginous joint - skull bones | | | | | | | | | | | | | |
| 6. | Bones become fragile in (1) Gout (2) Osteoporosis | | | | | | | rthritis | | (4) Myasthenia gravis | | | | |
| 7. | Symphysis is made of (1) Fibrocartilage (3) Elastic cartilage | | | | | | | (2) Synovial fluid (4) Hyaline cartilage | | | | | | |
| 8. | Which one is cartilaginous joint?(2) Symphysis(1) Synchondrosis(2) Symphysis(3) Diarthrosis(4) Both 1 and 2 | | | | | | | | | | | | | |
| 9. | Deposition of uric acid crystals within the synovial joint causes (1) gout (2) paralysis (3) osteoarthritis (4) Rheumatoid arthritis | | | | | | | | | | | nritis | | |
| 10. | The example of pivot joint is (1) hip joint (3) between atlas and axis(2) ankle joint (4) metacarpophalengeal joint | | | | | | | | | | | | | |
| | | | | | A | NSW | ER K | EY | | | | | | |
| | | | | | BI | EGINN | ER'S B | OX-1 | | | | | | |
| 1. | (2) | 2. | (1) | 3. | (2) | 4. | (4) | 5. | (3) | 6. | (1) | 7. | (4) | |
| 8. | (4) | 9. | (3) | 10. | (1) | 11. | (1) | 12. | (4) | | | | _ | |
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| BEGINNER'S BOX-5 | | | | | | | | | | | | | |
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